# The Drug Laboratory

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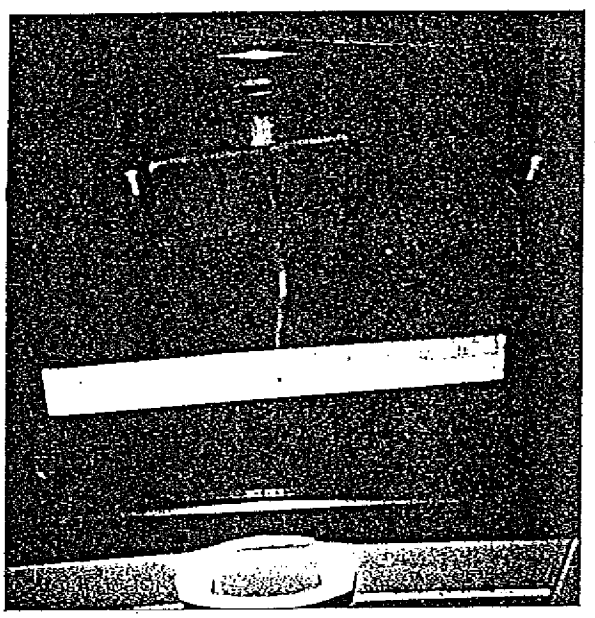
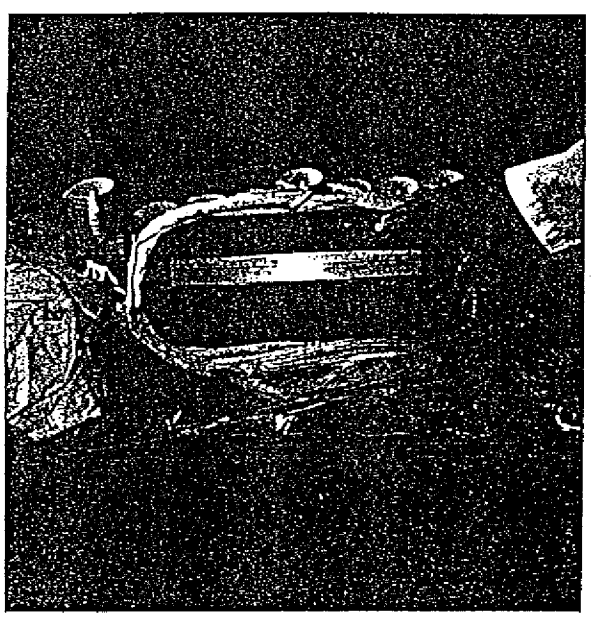
As a division of the Dept. of Public Health, the State Laboratory in Jamaica Plain is home to many bureau activities. The Drug Laboratory serves as an analytical center for material received in evidence from police departments across Massachusetts. The Drug Laboratory exists independently of law enforcement agencies and conducts its analyses with the single agenda of producing accurate and precise results. In addition to evidence preparation, the Drug Lab serves as a general reference lab for inquiries about drugs, pharmaceuticals, and tamperings. The twenty men and women in this unit retire 30,000 cases per year.

## Marijuana

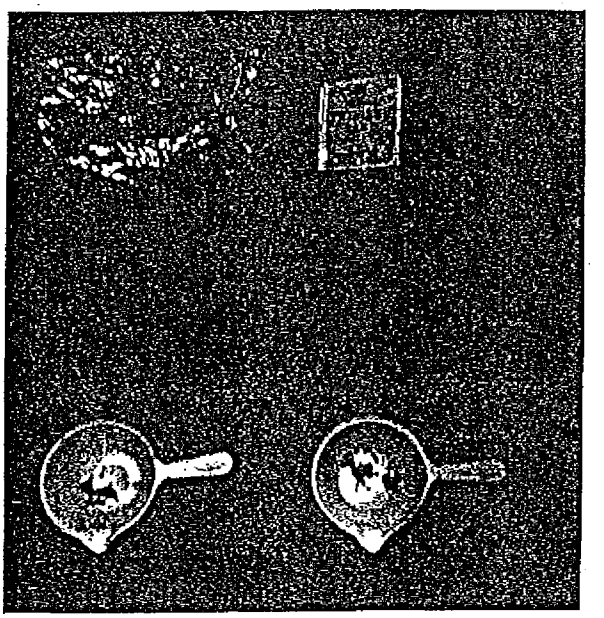
Whether it is marijuana or hashish, the Drug lab receives submissions and determines the presence of the drug from the levels of fifty pound bales of vegetable matter down to the traces left behind in the residue of pipes. Marijuana is a class D substance and by statute bears lighter penalties than cocaine and heroin.



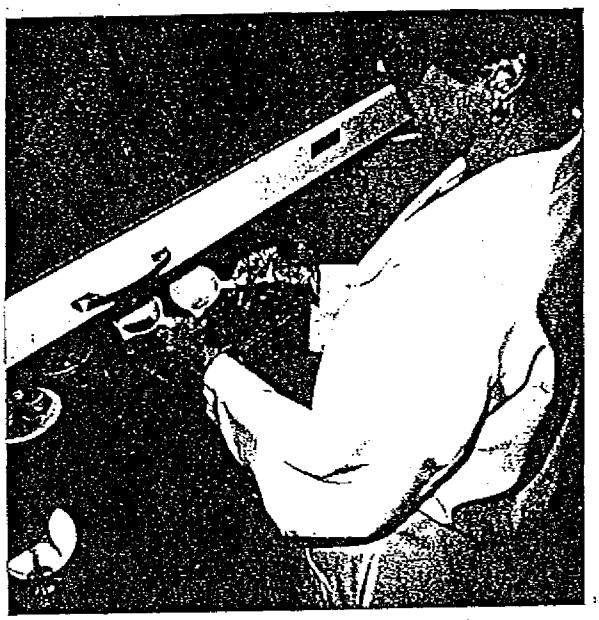
Hashish, which has greater concentrations of tetrahydrocannabinol than marijuana, carries greater legal penalties than marijuana. These two 5"x 3"x½" blocks weigh 190 grams.



Marijuana, smuggled in compressed ricks, harbors non-native molds, ildews, and insects.



Marijuana is distinguished from non-controlled vegetable matter by analysis of botanical features and chemical tests.



The samples are prepared and reacted with indicator reagents.

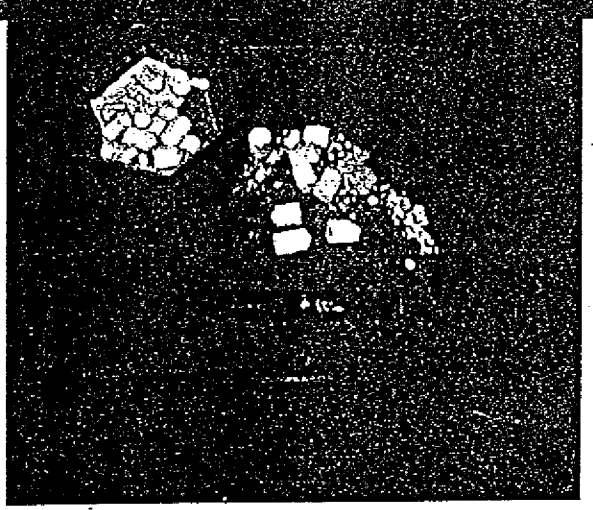
The marijuana reacts positively.

# Heroin

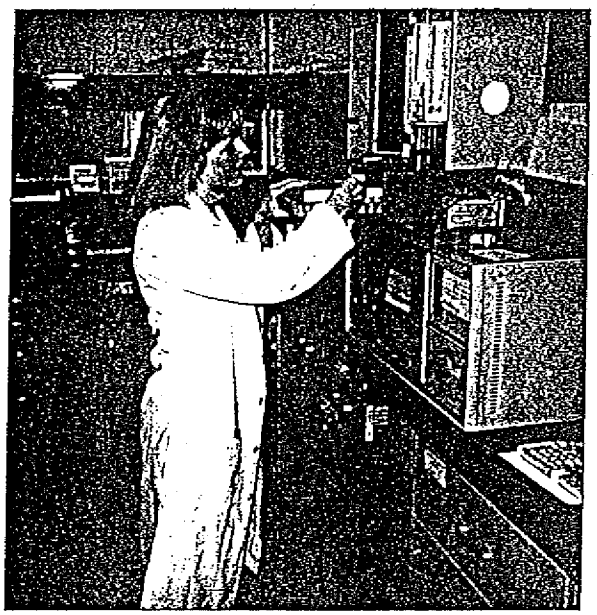
Heroin is the most addicting of the narcotics. It is classified as Class A and carries the highest penalties for possesion and distribution. Beyond the routine certificate of analysis presented in court, the Drug Lab is conducting special studies of heroin for consideration by several agencies.

The basic task of the Drug lab is to determine the presence of heroin in an unknown powder submitted by the police. An additional survey is being conducted to determine the proportion of heroin in the powder. Historically, heroin has been presented at the retail street level at concentrations in a range of 7 to 15 percent. The Drug Lab study has recently revealed a shift in concentration to a mode approaching 80 percent in Massachusetts, with some samples approaching 95 percent.

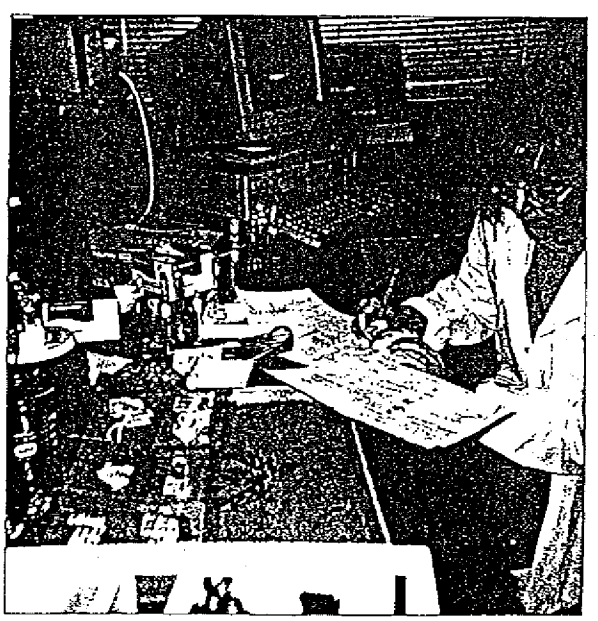
The Drug Lab has shared this data with the U.S. Department of Justice, Drug Enforcement Administration (DEA) and has substantiated the DEA's observation that the heroin of the Northeast is among the strongest in the country. The DEA has been monitoring the Drug Lab data for several years and the information has lead to increased concern about addiction through sniffing and death by overdose. The information about heroin concentration is also provided to local police agencies and hospitals. A new system has been developed to track heroin brand names or logos with their concentration. This is a useful tool for the DEA and other law enforcement agencies. From a public health perspective, the tracking system links certain brand names to overdoses.



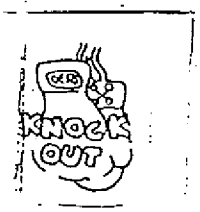
This 100 gram exhibit of heroin can produce 5,000 retail bags of powder with a street value approaching $100,000. Mandatory sentencing at this level carries a 5 to 20 year penalty.



Gas chromatography is the method used to determine the concentration of heroin in a black market powder.

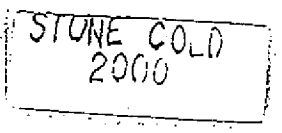


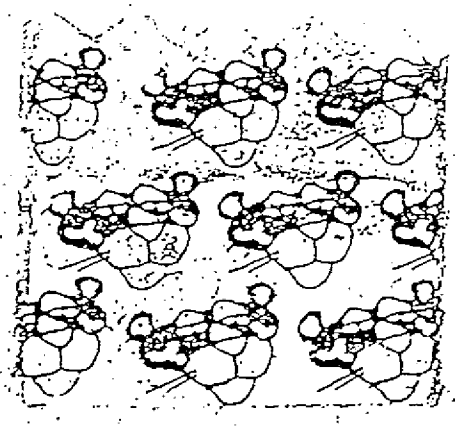
Concentration of heroin is determined for each logo or brand name. Police and hospitals track overdoses with this data.









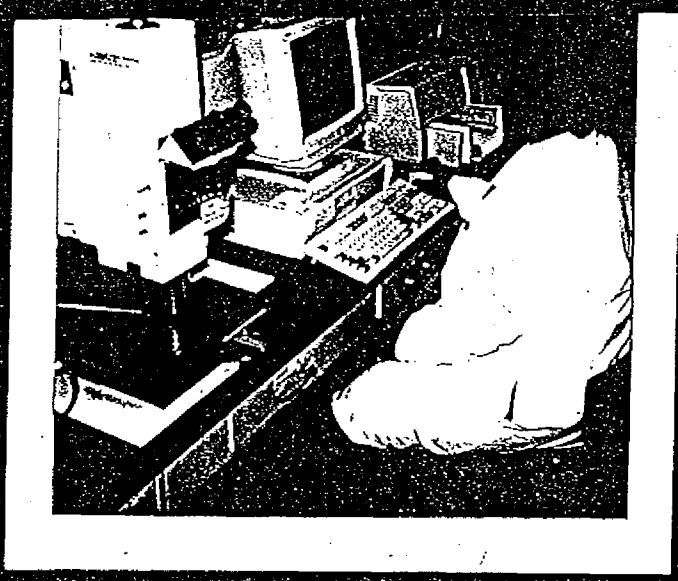

Different logos or brand names on heroin packages create user loyalty and identify a product on the street.

## Cocaine

Cocaine is the concentrated derivative extracted from the coca plant. Historically chewed by South American Indians, the raw leaf presented small doses of stimulant. Chemical extraction has increased the concentration of cocaine from the mild unit dose of a chewed leaf to the stronger unit dose delivered by dry powders when sniffed or injected. In the previous hundred years, cocaine hydrochloride was the substance of choice among cocaine abusers. The dry powder is diluted with other powders (starch, sugar, sodium bicarbonate) and concentrations of cocaine in user level powders historically ran from 5-15%.

In the history of cocaine, "crack" or cocaine base is the most recent form to evolve. Unlike cocaine hydrochloride, which is non-volatile, crack is volatile; and therefore, may be smoked which increases the speed with which the dose is delivered. Additionally, some authorities believe crack is fat soluble and may cross the "blood-brain" barrier more efficiently than cocaine hydrochloride.

The Drug lab has been conducting a survey of cocaine cases which distinguishes cocaine hydrochloride from crack. Since its appearance in Massachusetts a decade ago, crack submissions now comprise approximately 50% of the cocaine cases received. Historically, the concentration of cocaine hydrochloride abused is much less than the concentration seen in crack. Crack cocaine is commonly seen in concentrations greater than 90% at both the wholesale and reatail/user level. The trend appears to be continuing in the direction of a growing predominance of crack.



Infra-red spectrophotometry (IR) can provide unique profiles of substances. In the drug lab, it is used to distinguish "crack" cocaine from cocaine hydrochloride.

## Trafficking

Distribution of controlled substances can exist at any level of quantity. At certain levels of weight, mandatory sentences are imposed based on increments of 14 grams, 28 grams, 100 grams and greater than 200 grams. Trafficking levels of powder substances may be reached by a single mass of substance or the total weight of substance found in any number of packages prepared for distribution.

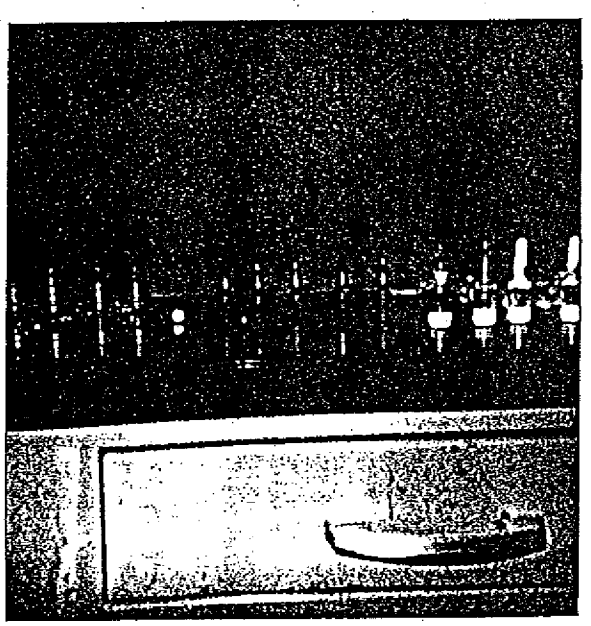
In most cases, a certificate of analysis is provided to the court which stands by itself as evidence of the nature of suspect material. When chemists are called by the courts to give clarifying testimony, more often than not it is for trafficking cases where the penalties are greatest.

Drug cases involving weapons, gang activity and terror enforcement or control can be moved up in jurisdiction to a federal court. In these cases, the Drug lab provides certificates of analysis and support testimony in U.S. District Court.

Trafficking in cocaine is determined by carefully weighing individually the total substance in all the retail units.

## Steroids

Steroids are substances which increase vascularization of muscle tissue, which in turn, enhances muscle bulk. "Pumping up" is the jargon for muscle development. Tragically,"pumping up" with a needle is required. Steroids are hydrolyzed (broken up to constituent parts) when ingested orally. For steroids to work, they must be delivered directly to the bloodstream by injection. Therefore, in addition to the problem of steroid driven aggression and chronic liver damage which can lead to cancer, the steroid abuser is subject to the same risk of infection as other intravenous abusers.



Packaged in glass ampoules, steroids must be injected to work. In the black market, "steroids" are the class of drug which is most often conterfeit or "a burn."

## Pharmaceuticals

At the street level of black market movement of capsules and tablets, what you see is not always what you get. As in all illegal drug activity, counterfeiting occurs in pharmaceuticals. Most pharmaceuticals arrive in the underground market through diversion. For example, pilferage by an employee of a pharmaceutical company, a pharmacy, or a health facility is diversion. Another form of diversion is the use of counterfeit prescriptions or the abuse of legitimate prescriptions.

In analyzing pharmaceuticals, the first consideration is whether it was manufactured legitimately, is it counterfeit, or an illicitly manufactured street drug?

## Residues and Needle Contents

Although all the substances received by the Drug Lab must be considered hazardous, none require greater discipline in the manner they are handled than residues and needle contents. Recovering the traces of a substance in a residue for analysis presents the greatest technical challenge in the laboratory. Combining that task with the additional problem of safely extracting the residue from a blood tainted syringe challenges the analyst to the limits of scientific technique.

Because of the biohazards involved (AIDS,hepatitis), needle submissions are limited to those cases where the needle is the only evidence or the case involves a death. In the case of a death, the presence of a narcotic in a needle yields important information to the police and medical examiners.

## Unknown Substances

The Drug Lab receives unknown substances and must determine the nature of the material. If an unknown is conclusively determined to be a controlled substance, evidence is provided to the courts in a certificate of analysis or direct testimony.

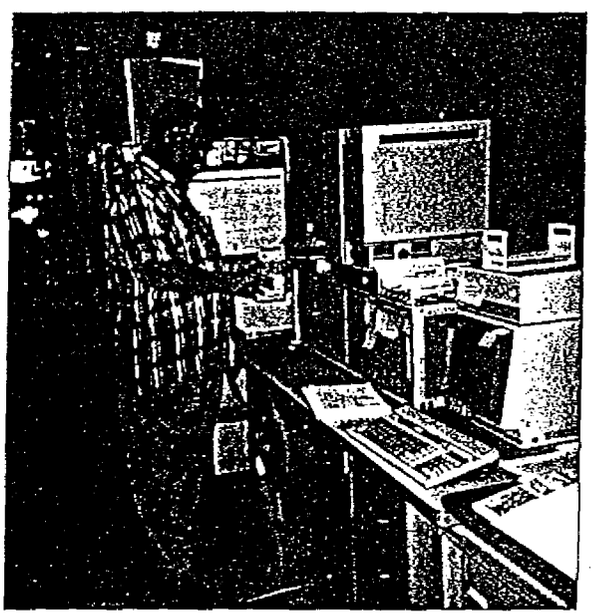
On occasion, the lab will receive unknowns which are not scheduled but are medically important. In 1996, a half dozen Massachusetts high school students were hospitalized after ingesting a local weed. Several of the adolescents fell into coma but all recovered. The material was submitted to the drug lab and was recognized as Datura stromium or Jimson weed. This plant contains poisonous alkaloids and is purported to induce hallucinations.

Most recently, compounds known as Dragon Blood and Love Stone have appeared in Massachusetts. The Drug Lab has detected no currently controlled substances in this material but we continually screen it when it appears in attempts to identify any known contraband. Love Stone is known to sometimes contain bufotenine, a hallucinogen.

## Tampering

Among the categories of cases received, tampering represents a very special class of crime. In hospitals and nursing homes throughout the Commonwealth, the aged and those in nth stage cancer receive morphine and other agents to reduce pain and make their final days bearable. Tampering is the process of diverting these prescribed drugs to other purposes.

The Drug Lab, with the Division of Food and Drug, is responsible for detecting diversion of legitimate pharmaceuticals by checking the contents of medical vials to determine whether they have been diluted or substituted entirely. Material may have been presented to the lab as a focus of a particular investigation or as a result of general institutional surveys.



Mass spectrometry (MS) is the work horse of the Drug Lab instrumentation, confirming the routine screening tests performed on evidence received.

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